CETONI

# CETONI Nemesys Ultra High Pressure

## Hardware Manual


**ORIGINAL MANUAL 2.07 – MAY 2023**

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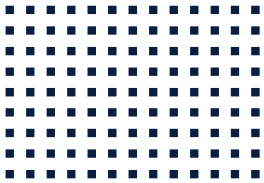


# 1 Overviews & Directories

## 1.1 Content

# 1.2 Revision History

| REV | DATE | CHANGES | VALID FOR |
|---|---|---|---|
| 1.00 | 03.08.2012 | Creation of the NEMESYS ULTRA HIGH PRESSURE module hardware manual | NEM-B206-01 A |
| 1.01 | 14.01.2012 | Changes considering the new 12-pole sensor interface | NEM-B206-01 B |
| 1.02 | 21.02.2013 | Added colors to the 12-pole sensor interface table | |
| 1.03 | 06.02.2014 | Changes considering the 12-pole sensor interface | |
| 1.04 | 06.05.2015 | Added notes regarding the Pressure Equipment Directive 2014/68/EU, corrected address | |
| 2.00 | 21.01.2016 | New layout, changes in connection technology and 10 ml syringe | NEM-B206-01 C |
| 2.01 | 10.03.2016 | Revision Manual Design | |
| 2.02 | 08.04.2016 | Removed Digital Input 3 from I/O interface table because it is not available | |
| 2.03 | 06.03.2020 | Adaptation of the scope of delivery | NEM-B206-01 D |
| 2.04 | 01.03.2021 | Images updated | |
| 2.05 | 08.04.2021 | Syringes added | |
| 2.06 | 21.12.2022 | Disposal instructions updated | |
| 2.07 | 05.05.2023 | Added 1000 bar Version | NEM-B206-01 D, NEM-B206-02 A |

**IMPORTANT**. In its current revision, this manual applies only to the product types listed in the last line. Should you require a manual from a previous revision, please do not hesitate to contact us. Please let us know your device type and email address and we will send you the appropriate manual as a pdf file.

The type of your product can be found on the label behind "Type:", according to the marked number in the following example:

# 2 Introduction

## 2.1 Foreword

Thank you for purchasing a product from CETONI. With this user manual we would like to support you as well as possible when handling the device. If you have any questions or suggestions, please do not hesitate to contact us.

## 2.2 Symbols and Keywords Used

The following symbols are used in this manual and should assist you in navigating through this document:

**TIPP**. Describes practical tips and useful information to facilitate the handling of the device.

**IMPORTANT**. Describes important information and other especially useful notes, in which no dangerous or damaging situations can arise.

**CAUTION**. Identifies a potentially harmful situation. Failure to avert this situation may result in damage to the product or anything in its proximity.

**ATTENTION**. Indicates a potentially dangerous situation. Failure to avert this situation may result in light or minor injuries or damages.

## 2.3 Norms and Directives

CETONI GmbH declares under its sole responsibility, that the individual Nemesys devices and the entire Nemesys syringe pump system comply with the health and safety requirements of the relevant European directives.

## 2.4 Application Purpose

### 2.4.1 General Description of the Device

The Nemesys Ultra High Pressure module is a syringe pump. It allows the emptying and filling of syringes by a relative linear movement between a syringe holder and a syringe piston holder.

### 2.4.2 Intended Use

The Nemesys Ultra High Pressure module is for the precise and pulsation-free dosage of fluid streams with an operating pressure of up to 890 bar and flow rates of nanoliters to milliliters per second. Its default operating environment is a laboratory-like room.

### 2.4.3 Reasonably Foreseeable Faulty Application

A use for applications distinct from the intended purpose can lead to dangerous situations and is to be omitted.

### 2.4.4 Security Measures

Safety for the operator as well as trouble-free operation of the device are ensured only when using original equipment parts and original accessories. Warranty claims will not be accepted for damage due to the use of alien accessories or expendables.

The device has been developed and designed to avoid harmful situations during intended use. However, the following safety measures have to be observed to exclude potentially remaining risks:

- CETONI GmbH points out the operator responsibility during use. Relevant laws and regulations at the location of use must be observed. In the interest of safety, operators and users are responsible to adhere to all relevant regulations.
- The device must neither be used as a medical product nor in medical applications.

- The device is designed and approved to work in fluidic systems, which fall within the scope of Article 4 Paragraph 3 of the Pressure Equipment Directive 2014/68/EU.

  This means that the system may not exceed a maximum volume of 1 liter. With the use of fluids from Group 1 according to Article 13 of the Pressure Equipment Directive 2014/68/EU, the maximum allowable system pressure is 200 bar. For fluids from Group 2 it is 1000 bar. If different, product-specific values for the maximum pressure are given in the section "Technical Data", these values must be complied with. Regarding the maximum operating temperature, the specification from the section "Technical Data" must be observed.

  CETONI GmbH is not liable for consequences that may arise if the user expands the system by peripheral devices, such that one of the values or both values are exceeded.

  It is the user's responsibility to become familiar with the mentioned Pressure Equipment Directive and to comply with the prevailing requirements.
- The operator has to ensure functional safety and proper condition of the device before use.
- The operator must be familiar with how to operate the device and the software.
- The device, accessories, and cables must be checked for damages before use. Damaged cables and interfaces must be replaced immediately.
- Cables are to be laid out such as to prevent the danger of tripping.
- The device must only be operated with the safety cover firmly attached. Any safety installations must not be tampered with nor rendered in-operational.
- Touching any of the devices moving parts during operation must be avoided due to the danger of contusions.
- It is forbidden to use the device in an explosive atmosphere or with potentially explosive materials.
- Safety goggles must be worn when operating or handling the device, in particular with corrosive, hot, or otherwise dangerous substances.
- Potential leakages at the device or connected parts and accessories may cause medium to exit under high pressures. This may cause potentially harmful situations. Tight fittings of all interconnected parts and the use of safety goggles must be ensured at all times.
- Please note that continuous use of the device may cause wear of the syringes. This may increase the likelihood of leakages. Leaking syringes must be replaces immediately.
- Assembly tasks, such as replacing of the syringe, may only be carried out when the device is not operating and completely de-pressurized. The device must not be shut down or stored with pressurized syringes. Before switching off the software that operates the device, the syringe must be de-pressurized.

- Operate the device on safety benches equipped with an emergency-stop button.
- The user has to ensure that the application setup includes measures and devices, such as safety valves, that relieve the system pressure in case of errors or malfunctions.
- Only stainless steel syringes specified for the device are to be used to avoid dangers due to bursting syringes.
- Transport, storage, and operation of the device at a temperature below 0°C/32°F with water within the fluidic system may cause damage to the device.

## 2.4.5 Measures for Safe Operation

#### 2.4.5.1 ELECTROMAGNETIC EMISSIONS

The device is intended for use in any type of facility, connected directly to the public power supply network that supplies buildings used for domestic purposes.

#### 2.4.5.2 ELECTROSTATIC DISCHARGE

Floors should be made of wood, concrete, or ceramic tiles. If the flooring is made of a synthetic material, the relative humidity must be at least 30%.

#### 2.4.5.3 ELECTRIC DISTURBANCES

The quality of the supply voltage should be to the standard of a typical business or hospital environment.

#### 2.4.5.4 MAGNETIC DISTURBANCES

Do not place power connector cables, even of other appliances, in close proximity of the devices and their cables. Mobile communication devices may not be used in closer proximity of the devices or their cables than the recommended safety distance!

### 2.4.6 Safety Features of the Device

In case of an emergency, the device may be switched off at any time by pulling the power supply connector. This will cause no damage to the device itself. Additionally, the device features a safety cover that shields all moving parts and reduces the risk of injury. Removing the cover will stop and switch off the device. Using the pressure sensor interface, the device may be programmed to automatically stop if a preset maximum pressure is exceeded. To avoid damage, the device is equipped with an overload clutch that will disconnect the driving unit and switch off the device in case of failure.

### 2.4.7 Device Condition

Despite a faultless manufacture of the unit, damage may occur at any time whilst the unit is in operation. With this in mind, the user must always carry out a visual check of the device and any attached or co-operated components prior to use. Particular attention must be paid to crushed power cables and deformed plugs as well as damaged feed lines (tubing, capillaries, etc.), connections and seals. If any damage to the device is noticed, the device is not to be used and CETONI GmbH should be informed. CETONI will ensure that operational conditions are reestablished within a reasonable time. Do not attempt to repair the unit yourself.

## 2.5 Warranty and Liability

This device left our company in perfect condition. Only the manufacturer is permitted to open the device. All guarantee and liability entitlements, in particular damage entitlements due to personal injuries, are void if the unit is opened by personnel not authorized by CETONI.

The duration of the warranty is 1 year from the date of delivery. It is not extended or renewed due to work carried out under warranty.

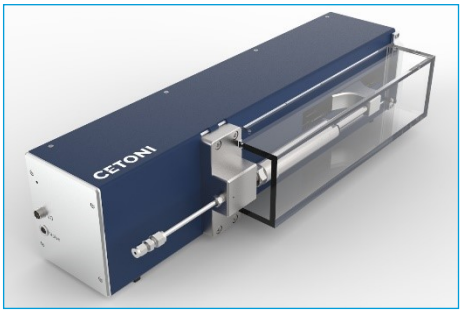
CETONI GmbH considers itself responsible for the unit with regard to safety, reliability, and function only if assembly, new settings, changes, extensions, and repairs are carried out by CETONI GmbH or an authorized center or agent, and if the unit has been used in accordance with this instruction manual.

The device conforms to the basic safety regulation standards. Industrial property rights are reserved on the circuits, methods, names, software programs, and devices.

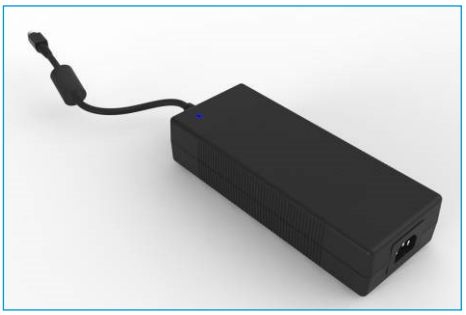
# 3 Scope of Delivery

The following items should be included

**NEMESYS ULTRA HIGH PRESSURE MODULE**

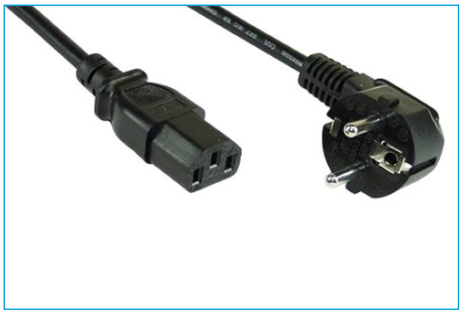



**POWER SUPPLY**



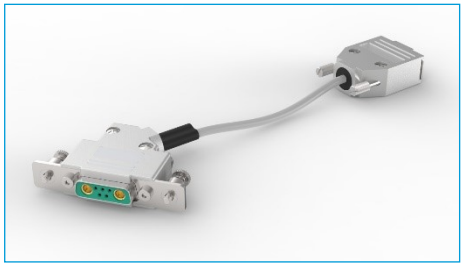
**MAINS CABLE**

(US or EU model as applicable)



**USB-TO-CAN ADAPTER**

**CAN CONNECTOR CABLE OR INTERCONNECT CABLE**



**TERMINATOR PLUG**

**SYRINGE(S) AS PER ORDER**

- Replacement seals


**MANUAL**

# 4 Technical Data

## 4.1 Operating Environment

| | |
|---|---|
| **OPERATING TEMPERATURE** | 0°C ~ 45°C |
| **STORAGE TEMPERATURE** | -20°C ~ 75°C |
| **STORAGE / OPERATING HUMIDITY** | 20% – 90%, not condensing |
| **SOUND POWER LEVEL** | ≤70 dB(A) |

## 4.2 Mechanical Data

| | |
|---|---|
| **WEIGHT** | 21 kg |
| **DIMENSIONS (L x W x H)** | 600 x 194 x 146 mm |

## 4.3 Electrical Data

| | |
|---|---|
| **SUPPLY VOLTAGE (POWER SUPPLY)** | 90 ~ 264VAC |
| **FREQUENCY** | 47 ~ 63 Hz |

## 4.4 Interfaces

| | |
|---|---|
| **CAN** | 1 Mbit/s |
| **RS-232** | Contact us for more information. |
| **ACCESSORY PORT** | |

# 4.5 Wetted Parts

The syringe holder is made of stainless steel type 1.4404 (316L).

The materials the syringes consist of can be found in the following table. O-rings are used as seals. They will be complemented by sliding rings in the future. For some syringes sliding rings are already available upon request.

O-rings have a significantly lower leakage, however, wear out much more quickly and generate abrasion. Sliding rings wear out much slower, however, exhibit higher leakage. The preload of the sliding rings is also generated by O-rings.
Backup rings avoid, that the O-rings are damaged at very high pressure. They have no direct media contact, but come into contact with leakage.

| SYRINGE | MATERIAL | MATERIAL O-RINGS | MATERIAL BACKUP RING | MATERIAL SLIDING RING |
|---|---|---|---|---|
| **10 ml** NEM-B506-01 B | 1.4462 & 1.4404 / 1.4571 (318 LN & 316 L / 316 Ti) | FKM 80 shore A min. | PEEK modified | / |
| **25 ml** NEM-B514-01 A | 1.4571 ( 316 Ti) | FKM 80 shore A min. | PEEK modified | / |
| **75 ml** NEM-B551-01 A | 1.4404 / 1.4571 (316 L / 316 Ti) | As ordered 70 shore A min. | PEEK modified | PTFE filled with carbon |
| **100 ml** NEM-B515-03 A | 1.4571 (316 Ti) | FKM 70 shore A min. | PEEK modified | PTFE filled with carbon |
| **250 ml** NEM-B516-01 A | 1.4571 (316 Ti) | FKM 70 shore A min. | PEEK modified | PTFE filled with carbon |

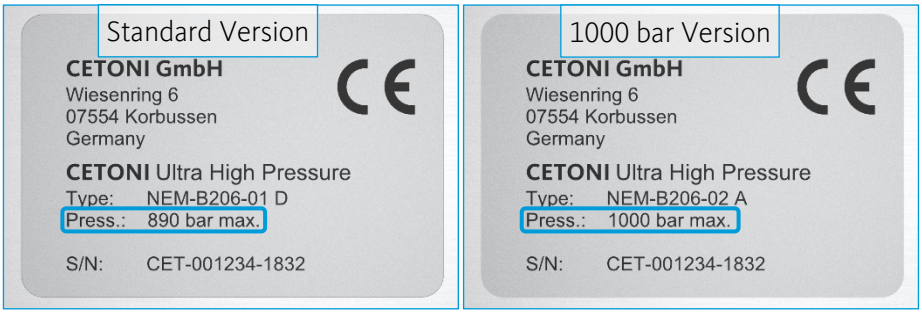
**ATTENTION**. Before using the Syringes, please check the chemical resistance of the wetted materials against the dosing liquid.

**ATTENTION**. Only use fittings, capillaries and seals specified for the anticipated pressure levels.

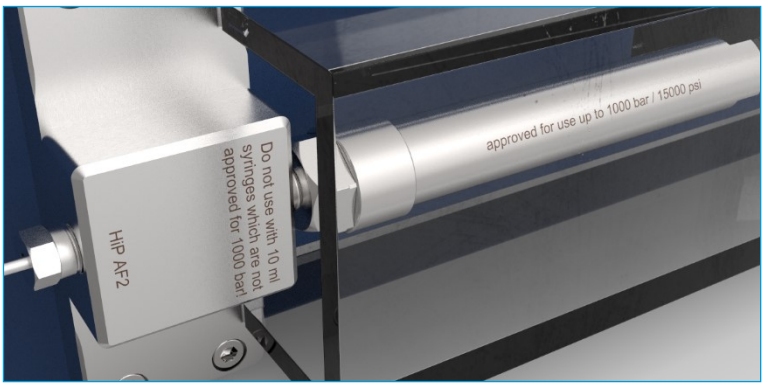
# 4.6 Fluidic Data

The Nemesys Ultra High Pressure module is available in a standard version and in a 1000 bar version. The drive of the 1000 bar version generates a higher force which, in conjunction with a special 10 ml syringe, enables a maximum pressure of 1000 bar (15000 psi) to be generated.

The two versions can be identified by the point Press. on the type plate. (if this point is not present on the type plate, it also means that it is the standard version):



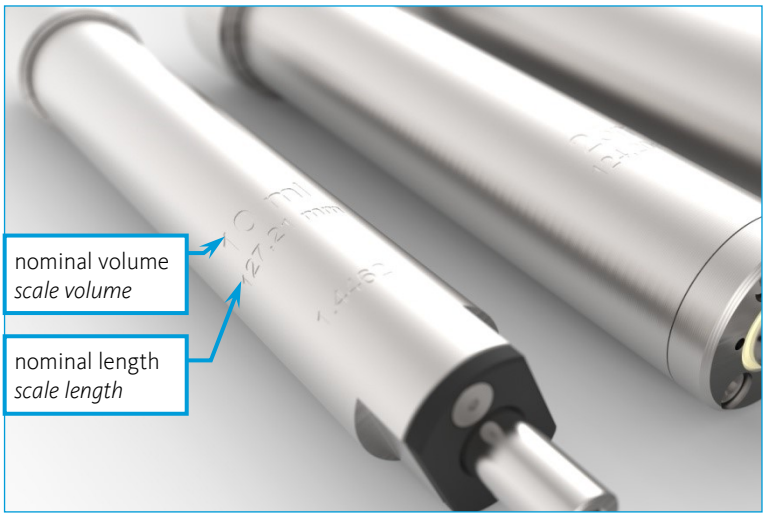

Furthermore, their syringe holders have different outlets, which are described in sections 6.2.1 and Fehler! Verweisquelle konnte nicht gefunden werden.. Both devices may be operated with the same syringes, except for the 10 ml syringe. In combination with the 1000 bar version of the device, only the use of a syringe approved for this purpose is permitted. This syringe is marked with a corresponding inscription:




**CAUTION**. Do not use the 1000 bar version of the Nemesys Ultra High Pressure module with 10 ml syringes that are not approved for 1000 bar!

**ATTENTION**. As pressure increases, so does seal wear. Check the seals more frequently during high-pressure use and replace them when they show signs of wear to prevent leaks.

The values that you require for syringe configuration (see 6.1.2) are listed in the table below. Additionally, the nominal stroke of the syringe, which corresponds to the nominal volume, is engraved on the syringe. Originating from glass syringes, the nominal stroke is denominated *scale length* in the software and the nominal volume is termed *scale volume*. By default, the syringes have a small safety reserve in stroke length – the maximum stroke length is also given in the table below, called *piston stroke*.

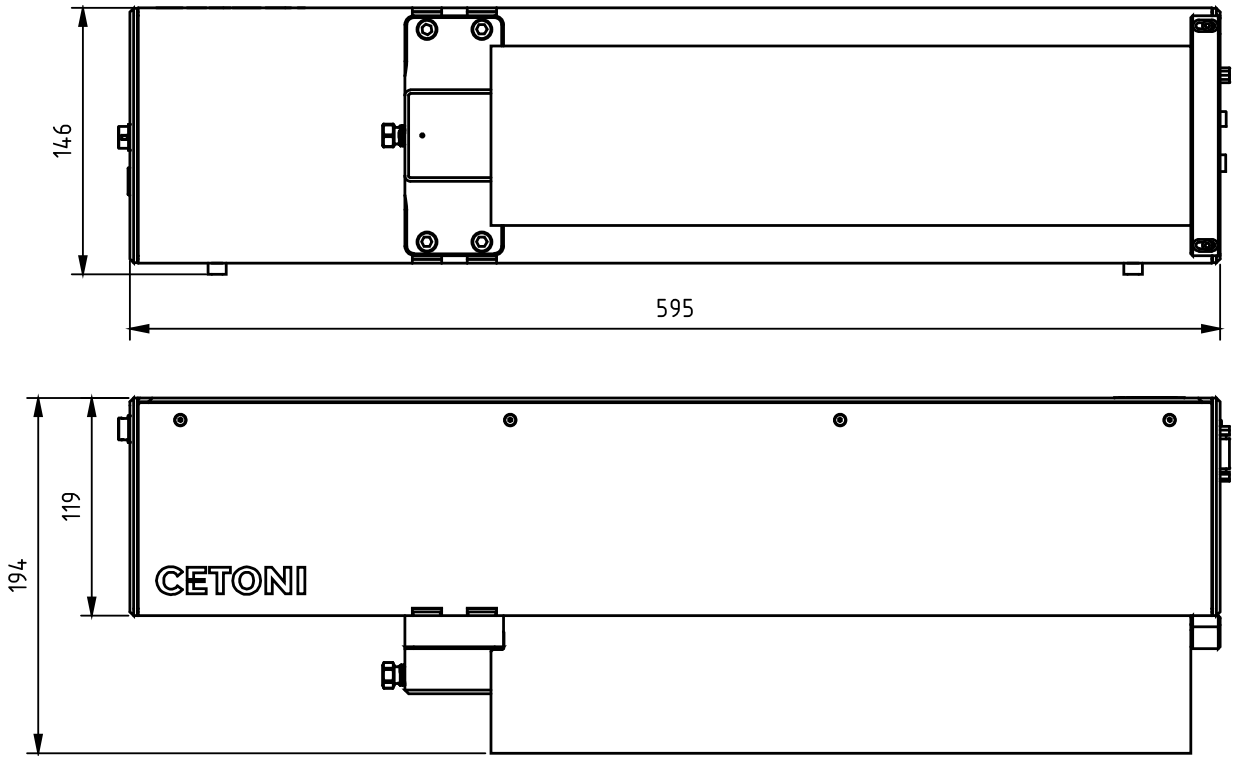



| **NOM. VOLUME** *scale volume* **[ml]** | **NOM. STROKE** *scale length* **[mm]** | **MAX. STROKE** *piston stroke* **[mm]** | **MAX. PRESSURE** **[bar / psi]** | **MIN. FLOW** **[nl/s]** | **MAX. FLOW** **[ml/s]** |
|---|---|---|---|---|---|
| **10** NEM-B506-01 B | 127,21 | 130 | 890 / 12900 (1034 / 15000)* | 0,20 (2,00)* | 1,03 (0,9)* |
| **25** NEM-B514-02 A | 124,20 | 128 | 345 / 5000 | 0,52 | 2,63 |
| **75** NEM-B551-01 A | 121,71 | 130 | 110 / 1600 | 1,58 | 8,06 |
| **100** NEM-B515-03 A | 124,24 | 128 | 85 / 1230 | 2,06 | 10,53 |
| **250** NEM-B516-02 A | 127,25 | 130 | 35 / 510 | 5,04 | 25,69 |

*: Achievable with the 1000 bar version of the Nemesys ultra-high pressure module in combination with an associated 10 ml syringe.

**IMPORTANT**. The maximally achievable pressures are theoretically determined values which, depending on seal friction, temperature, and other environmental influences, may not be reached at all flow rates in practice.

# 4.7 Dimensions



# 5 Initial Start-Up

To ensure a trouble-free initial operation of your Nemesys Ultra High Pressure module, work through the sections below.

**IMPORTANT**. Please read this manual and the accompanying software manual carefully and completely before setting up and operating your Nemesys Ultra High Pressure module.

## 5.1 Software Installation

Supplied software and drivers must be installed prior to connecting this or any other CETONI device to a computer. Please refer to the accompanying software manual, which may be found on the supplied CD, for a detailed description.

**IMPORTANT**. Please follow the instructions and install software and device drivers before connecting the device to your PC via USB.

## 5.2 Set Up the Device

Place the Nemesys Ultra High Pressure module on an even and horizontal surface, such as a table, base cabinet or instrument trolley. Make sure that the surface has an adequate load capacity and keep a sufficient distance from the edge, to prevent the device from falling down.

## 5.3 Connecting the Device

After having installed software and drivers you are ready to take the device into operation. The steps required for (re-)connecting the Nemesys Ultra High Pressure module, either stand-alone or in combination with additional devices, are detailed in the software manual that should be consulted prior to initial operation.

There are various alternatives for how the Nemesys Ultra High Pressure module may be connected and used – these are explained in more detail below.

**ATTENTION**. Danger due to damaged cables and connectors! Regularly check the device and all cables for damages! Never operate a device with damaged cables or connectors! Only use supplied original cables!

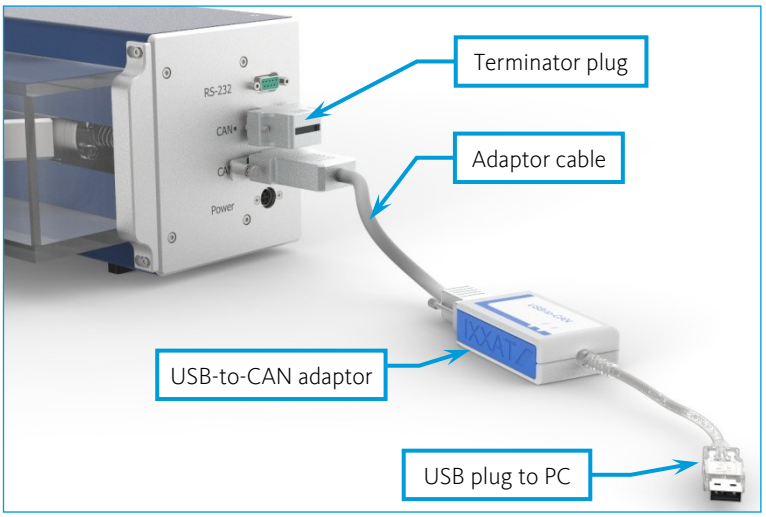
**ATTENTION**. Danger of tripping over power and connecting cables! Always place cables such as to avoid any danger of tripping!

### 5.3.1 Connection and Operation as a Single Device

Connect the USB plug of the USB-to-CAN adaptor with an available USB port (USB Type A) of your PC. Next, use the provided D-Sub-to-IXXAT cable to connect the 9 pin D-Sub plug of the USB-to-CAN adaptor with the Nemesys Ultra High Pressure module's CAN socket (male) right above the power socket.

Attach the terminator plug to the upper CAN socket (female) of the XL module.

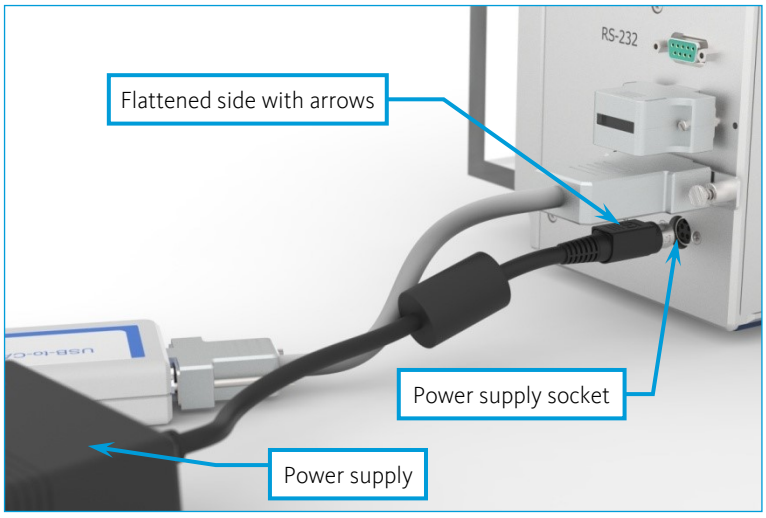
**IMPORTANT**. Always plug the terminator plug into the socket of the last module in your system. Otherwise there may be disruptions in data communication.



Connect the plug of the provided power supply to the respective port of the Nemesys Ultra High Pressure module labeled *Power*. The flattened side of the plug with the two small arrows has to point upwards.

The plug locks into place. To unplug, you must pull the back the black sleeve of the plug with the two small arrows – do not pull the cable directly.

Use the supplied equipment connection cable to connect the power supply with the power socket (mains). The device may be used with voltages from 90 to 264 V (AC, alternating current) at 47 to 63 Hz.




## 5.3.2 Use with an Existing CETONI System

The Nemesys Ultra High Pressure module can be connected to an existing CETONI system. In this case, you do not need the USB-to-CAN adapter, because this is already included in the base module of the system. Then, use a CAN Interconnect cable to connect the lower CAN socket (male) of your new XL module to the CAN socket of the last module of the existing system. Interconnect cables are available from CETONI GmbH.

Since the base modules only provide 24 VDC, but the Nemesys Ultra High Pressure module requires a power supply of 48 VDC, it cannot be supplied by a base module, but needs its own power supply. The connection of terminator plug and power supply is carried out as described in section 5.3.1.

**IMPORTANT**. Please read and follow the appropriate section in the accompanying software manual before connecting additional devices.

### 5.3.3 Connecting Additional Modules to the Nemesys Ultra High Pressure Module

In order for the Nemesys Ultra High Pressure module to provide 24 VDC at the upper socket labeled CAN for connecting additional modules, the connector underneath labeled CAN must be connected to the output socket of a base module using an interconnect cable. To connect the modules, you need a second interconnect cable. The terminator plug must then be plugged into the last of these modules.

**IMPORTANT**. Please read and follow the appropriate section in the accompanying software manual before connecting additional devices.

# 6 Operating the Hardware

## 6.1 Syringes

The Nemesys Ultra High Pressure module must only be used with those syringes that have been developed especially for this module; other syringes may not withstand the forces applied by the pump during operation. This may cause damages to the syringes and the module or injuries to the operator.

**ATTENTION**. Use the Nemesys Ultra High Pressure only with one of the exclusive syringes especially developed for it by CETONI GmbH.

**CAUTION**. Do not use the 1000 bar version of the Nemesys Ultra High Pressure module with 10 ml syringes that are not approved for 1000 bar!

**ATTENTION**. As pressure increases, so does seal wear. Check the seals more frequently during high-pressure use and replace them when they show signs of wear to prevent leaks.

### 6.1.1 Maintenance of the Syringes

The maintenance of the syringes, such as the disassembly and the change of the seals is treated in chapter 8.1.

### 6.1.2 Syringe Configuration

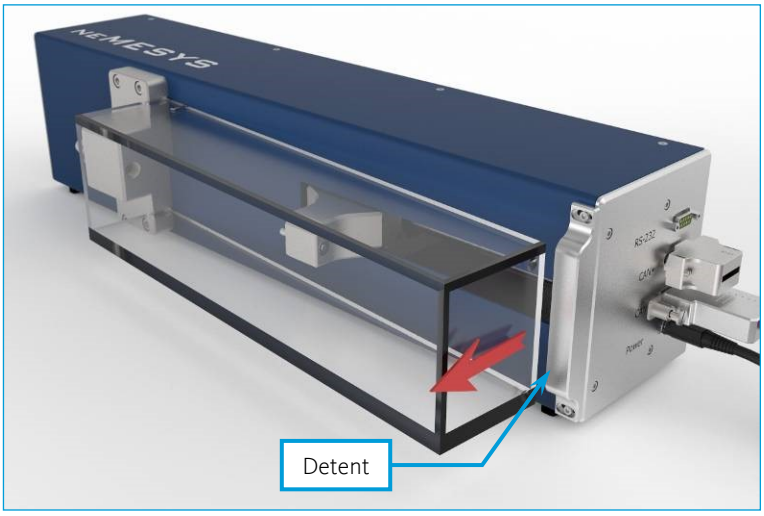
The syringes for the Nemesys Ultra High Pressure module are preconfigured in the software. If your syringe is not available in this selection, for instance because it is newer than the software version, you must configure it. Only this will ensure that the flow rates and dosed volumes shown by the software are equivalent to the actual values, respectively; it also prevents mechanical damages due to wrong stroke distances. The correct procedure to configure syringes is described in detail in the accompanying software manual; please proceed as described therein. The data and values that you require for syringe configuration can be found in chapter 4.6.

## 6.1.3 Installation on the Device

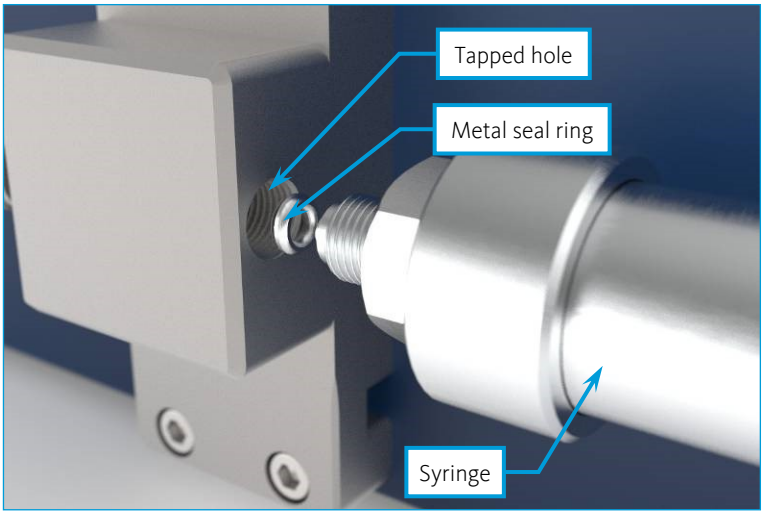
1. Perform a reference move as described in the software manual. This is to calibrate the position of the piston holder. This ensures that the syringe volume will be optimally utilized and that no collision and thus damage to the syringe or the module will occur during operation.

**CAUTION**. Carry out a reference move before mounting a syringe. This ensures optimal use of the syringe volume and avoids potential damages to syringe and module.

Now, use the software to move the piston holder to a position appropriate for mounting the syringe. Next, remove the safety cover by pulling at its distant end (as shown in the picture below) until the cover is released.

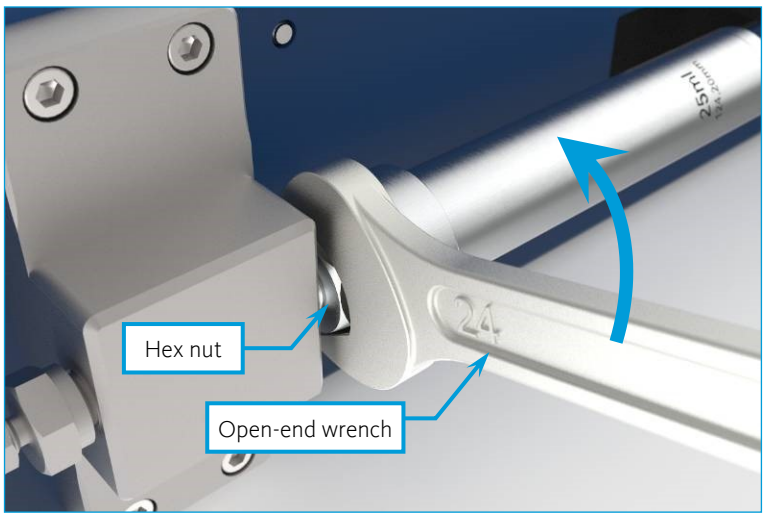



2. To establish a leek-tight connection between the syringe and syringe holder, a metal seal ring is used. Place the metal seal ring into the tapped hole of the syringe holder and screw in the syringe by hand until it stops.

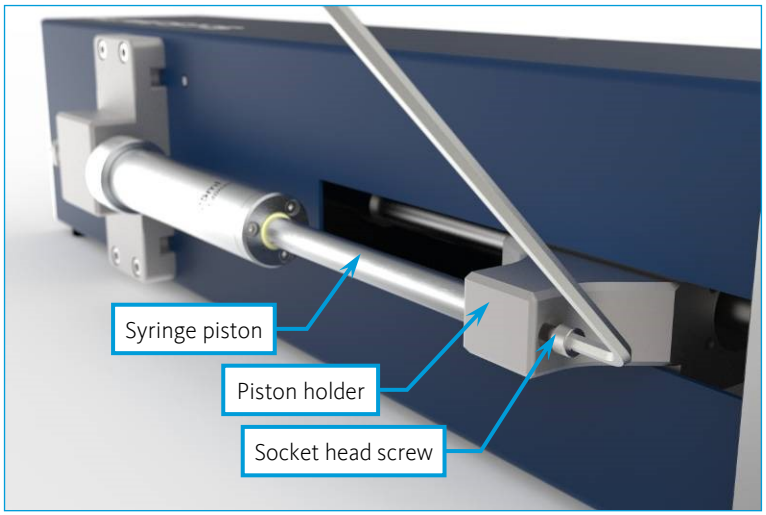


3. The syringes for the Nemesys Ultra High Pressure module have a 24mm hex directly behind the threaded tip. Use a 24 mm open-end wrench and tighten the syringe by another half to three-quarters turn.

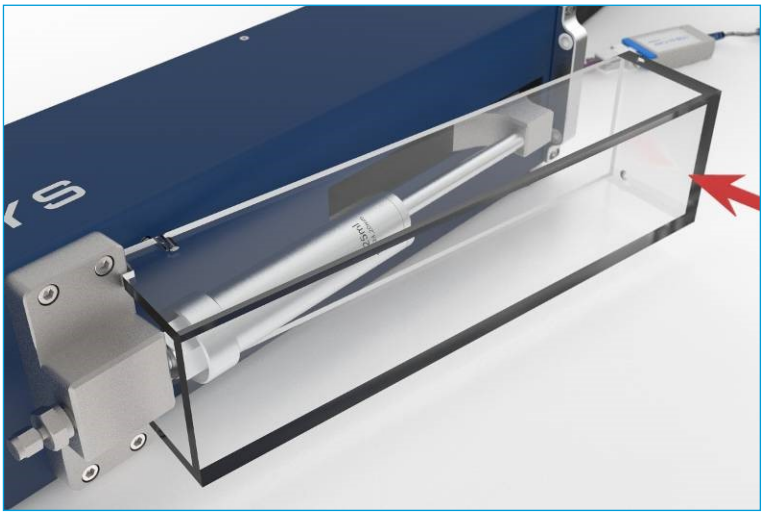
   If you remove the syringe and reinstall it later, a quarter turn is all that is needed for a tight connection upon hand tightening.




4. Connect the syringe piston to the piston holder using the supplied socket head screw. Tighten the screw using a 4 mm Allen key.




5. Then set the safety cover back on the device. To do this, insert the two hooks of the cover into the recesses of the syringe holder and press the cover back into the detent.



**CAUTION**. When used over extended periods of time, the syringe may display wear. Please check the condition of the syringe regularly and exchange the seals or the syringe as required.

**CAUTION**. Please ensure that the device has been stopped using the software prior to mounting or exchanging syringes.

## 6.2 Fluidic Connection

The standard version of the Nemesys Ultra High Pressure module has a high-pressure cone thread fitting on the outlet side of the syringe holder, which is necessary due to the high potential pressures when using the 10 ml syringe. Its operation is explained in section6.2.1.

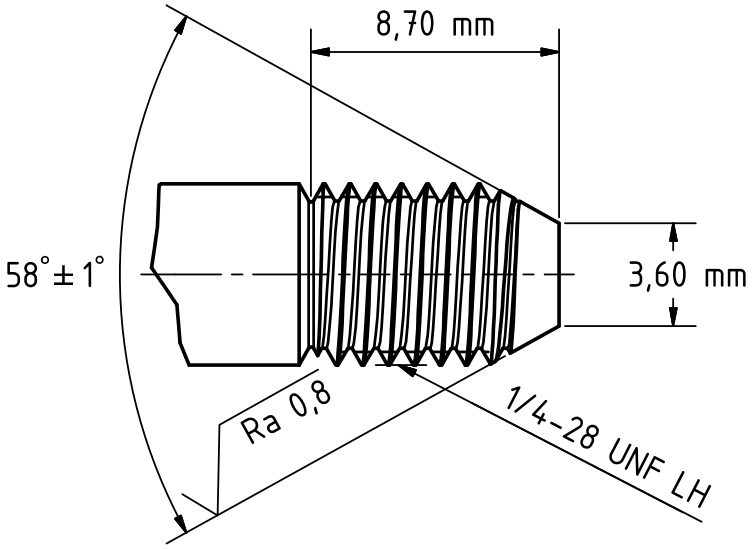
For the use of the other syringes, which do not reach such high pressures, a reducer fitting to 1/8" tube is supplied with the unit. The operation of this fitting is described in section 6.2.2.

The syringe holder of the 1000 bar version of the Nemesys Ultra High Pressure module has a HiP (High Pressure Equipment Co.) AF2 connection on the outlet side which is explained in section Fehler! Verweisquelle konnte nicht gefunden werden..

**CAUTION**. Make sure that the tubing and connection technology, you want to use, are suitable for the expected pressures.

## 6.2.1 High Pressure Cone and Thread Connection

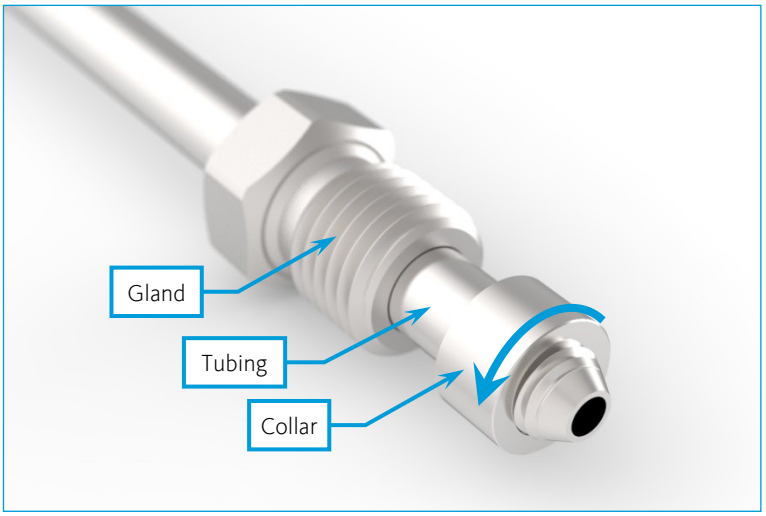
The high pressure connection is designed for the use of high-pressure tubing with an outer diameter of 1/4" in conjunction with a 7/16"-20 UNF fitting. Therefore, the end of the tubing must be provided with a 58° cone and a 1/4“-28 UNF left-hand-thread. The exact specifications can be found in the following drawing:




Tubing that is already provided with this kind of end machining can be ordered in different lengths directly from MAXIMATOR GmbH, or from CETONI. The same applies to a hand tool for making the cone and a hand tool for threading. The respective order numbers of MAXIMATOR GmbH can be found in the following table:

| **TUBE LENGTH [mm/ (inch)]** | **ORDERING NUMBER** |
|---|---|
| 69,85 / (2,75) | 21N4M-2.75-316 |
| 76,2 / (3) | 21N4M-3-316 |
| 101,6 / (4) | 21N4M-4-316 |
| 152,4 / (6) | 21N4M-6-316 |
| 203,2 / (8) | 21N4M-8-316 |
| 254 / (10) | 21N4M-10-316 |
| 304,8 / (12) | 21N4M-12-316 |
| **CONE TOOL** | CT4M |
| **TAB** | TT4 |

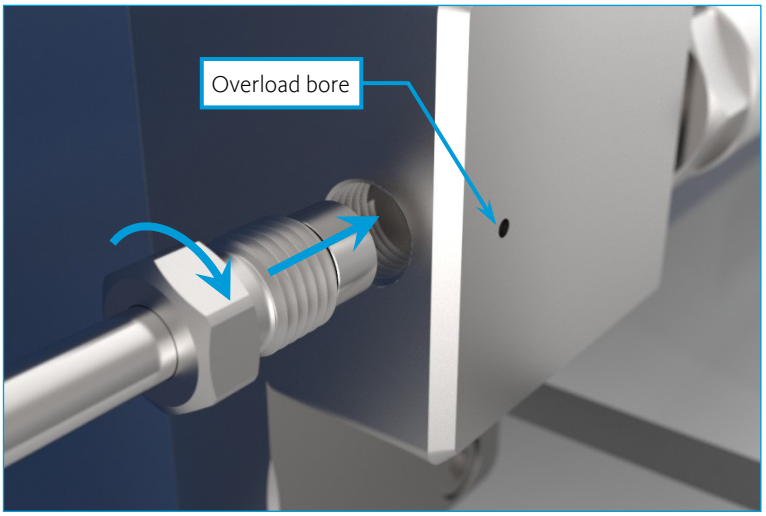
For installation of the tube, slide the gland onto the prepared tube and then screw the collar on. Keep in mind that you must rotate the pressure ring counterclockwise due to the left-hand thread.




Insert the tubing with the collar into the tapped bore of the syringe holder and tighten the gland by hand until it stops. Use a 1/2" open-end wrench and tighten the syringe by another half to three-quarters turn.

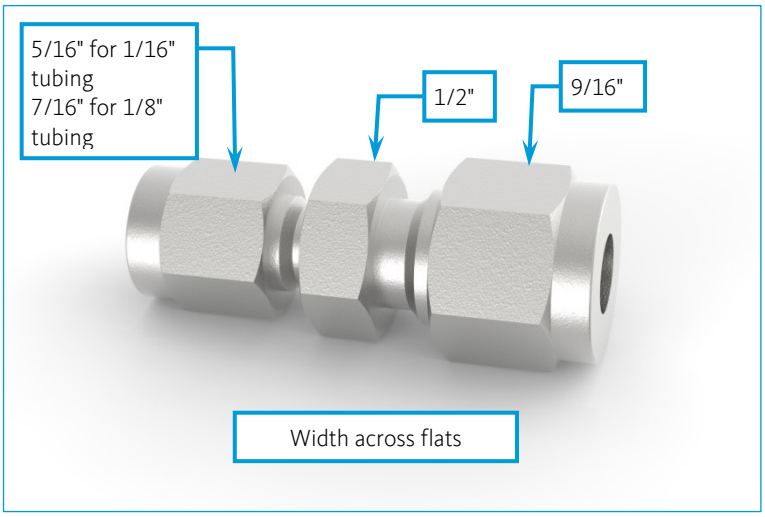
After the installation is completed, check the leak tightness of the connection and pull the gland a little tighter if liquid emerges from the overload bore.

If you remove the connection and install it again later, after the finger tightening the connection another quarter turn is sufficient for a tight connection.



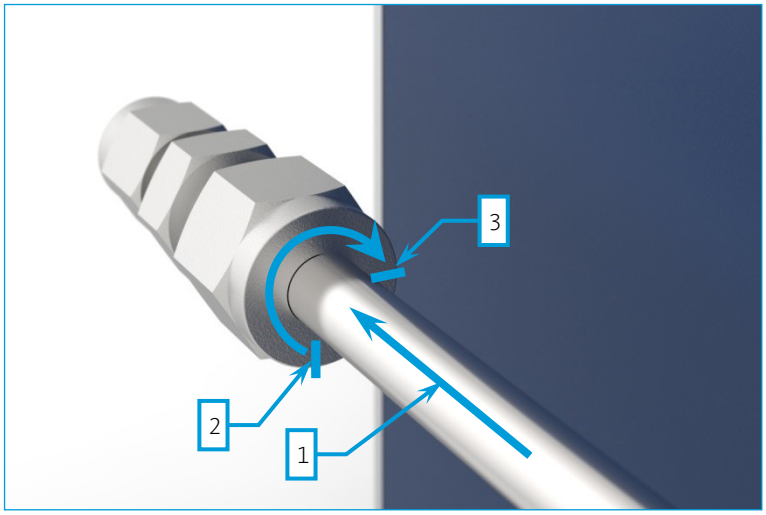
## 6.2.2 Reducer Union

In order to use thinner tubing, if you work with syringes, which do not produce such a high pressure, the device is supplied with a Swagelok reducer union for 1/8” tubing. It is suitable for using capillaries made from metal (e.g. stainless steel, titanium) and plastic (e.g. PTFE, PEEK). Please refer to information provided by the respective manufacturer with respect to maximum pressure. The operation of the reducer union is explained below:




### 6.2.2.1 FIRST-TIME INSTALLATION

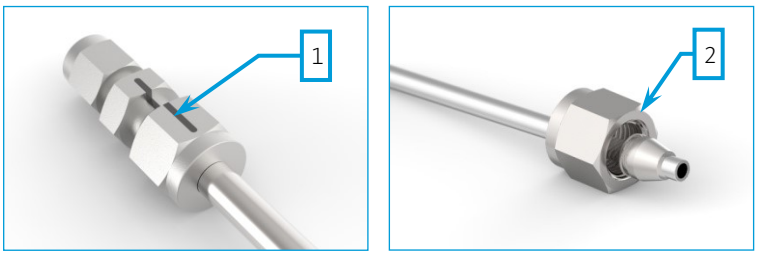
1. Fully insert the capillary into the fitting and against the shoulder. Then rotate the cap nut finger-tight.
2. Mark the cap nut at the 6 o’clock position.
3. Tighten the cap nut three-quarters turn to the 3 o’clock position with an open-end wrench while holding backup on the body of the union with a second wrench.



#### 6.2.2.2 DISASSEMBLY

**CAUTION**. Release pressure from the system before loosening the fittings.

1. Before disassembly, draw a marker line across the cap nut and the body of the union. In this way you create a reference for retightening the cap nut to exactly the same position it was in before.
2. Pull out the capillaries. The cap nut and the ferrules remain on the capillary.




#### 6.2.2.3 REASSEMBLY

1. To reassemble, insert the capillary with preassembled ferrules into the fitting body until the front ferrule seats against the fitting body.
2. Rotate the nut with open-end wrench to the previously pulled-up position as indicated by the marks you made before; at this point you will feel a significant increase in resistance.
3. Retighten the nut slightly. Done!

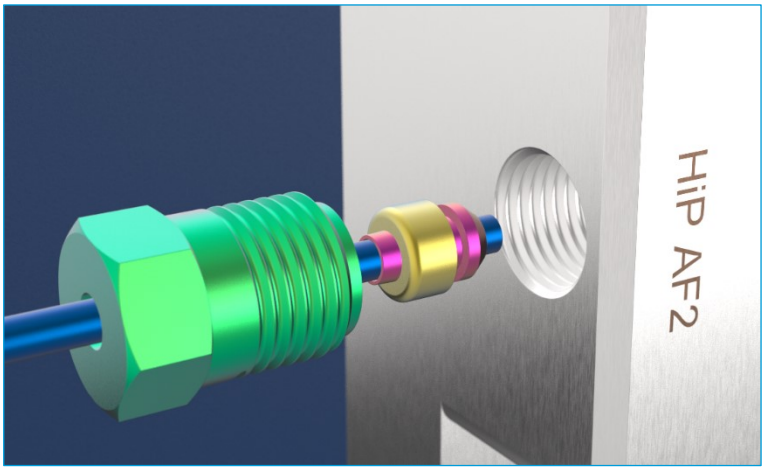
**CAUTION**. After (re-)connecting, check the tightness of all fluidic connections on a regular basis.

### 6.2.3 HiP (High Pressure Equipment Co.) AF2 Connection

The syringe holder of the 1000 bar version of the Nemesys Ultra High Pressure module is equipped with a connection that allows the use of AF2 fittings made by HiP (High Pressure Equipment Co.). This type of connection only allows the use of metallic 1/8" capillaries. The operation is described below:

First slide the gland (green in the picture) and then the pre-assembled two-piece sleeve (gold and purple in the picture) onto the tube that is to be mounted (blue in the picture). Make sure that the mounting orientation of the sleeve is as shown in the picture.

Then push the tube into the hole until it stops and tighten the banjo bolt to a torque of 34 Nm (25 ft*lbf) using a 1/2" open-end wrench.



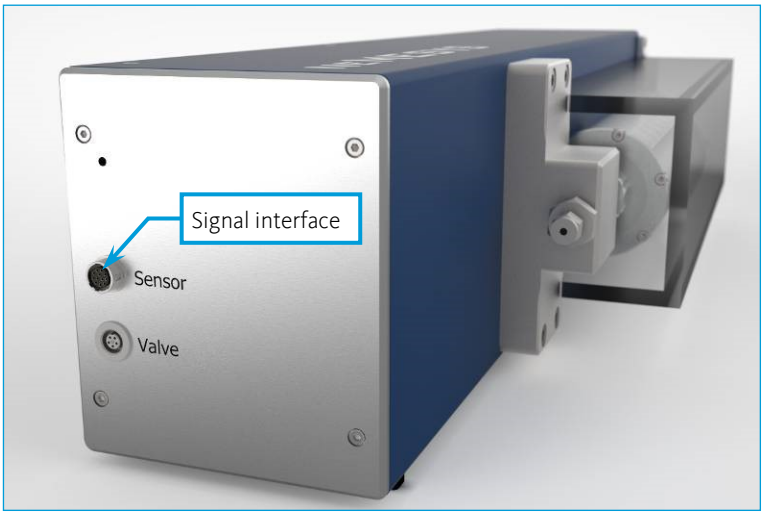
# 6.3 Accessory Port

**CAUTION**. Danger of stumbling due to connecting cables! Place cables and tubing in such way as to avoid any danger of stumbling!

**IMPORTANT**. Only devices or accessories from CETONI may be connected to the interfaces.
Please read and observe the respective section of the associated software manual before connecting and using accessories.

The Nemesys Ultra High Pressure module is equipped with an accessory port that allows the integration of accessories such as valves and pressure sensors. To do this, plug the cable connector of the accessory component into the socket of the Nemesys Ultra High Pressure module until it engages. Make sure that the plug can only be inserted when the coding nose is pointing upwards.

To remove the accessory component, pull on the metal sleeve of the plug. This releases the lock and the plug can be easily removed.



# 6.4 Overload Clutch

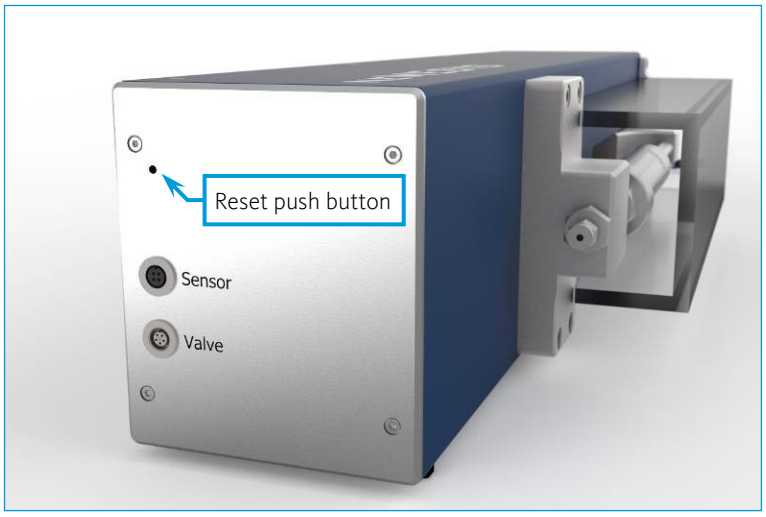
In order to avoid an overload of the Nemesys Ultra High Pressure module and the syringes, the module features an overload clutch. The clutch is designed so that the maximum pressures specified in the data sheet are reached. When the allowed driving force is exceeded, the clutch disconnects the drive from the piston holder and switches off the drive.

The clutch is purely a safety measure – it is not a substitute for a pressure sensor!

**CAUTION**. You should use a pressure sensor in all your applications to avoid dangerous situations. The built-in overload clutch is only there as a safety device in case of errors or faults.

## 6.4.1 Overload Procedure

1. Make sure to remove the cause for the overload.
2. Following an overload interrupt, the overload clutch may re-engage automatically; the module may then directly be controlled again via the software. If this is the case, please continue with step 4.
3. In some cases, the overload clutch will not re-engage automatically and the module must be reset manually. For this, there is a push button behind a small hole at the front plate of the module.




Push and hold the button using a thin object (wire, pin) to bridge the clutch sensor and to allow operation of the module. Now carefully build up a pressure by setting a very low flow rate until the clutch re-engages – you will hear a clear 'clack' sound.

4. Due to the separation of drive and piston holder, the real position of the piston holder may deviate from that stored in the software. In order to reset the module, perform a reference move using the software. Following this recalibration, the module is again ready to be used.

**CAUTION**. To avoid another case of system overload, the reference move should be carried out with the syringe removed from the module.

## 6.5 Valve Interface

The Nemesys Ultra High Pressure module also features a valve interface. It is located on the front plate of the module and allows the direct control of a high-pressure valve unit. Please refer to the valve's manual on how to connect and operate the valve.

# 7 Transport and Storage

Use the original packaging for transportation or shipping of the module.

Concerning the storage conditions, please observe the data from chapter 4.1.

Although the syringes are made of corrosion-resistant material, surface corrosion may be caused by media residues during storage. For that reason, disassemble and clean the syringes prior to periods of non-use.

**CAUTION**. Transportation, storage or operation of the modules below 0°C with water in the fluid passages may cause damage to the module.

# 8 Maintenance and Care

If used in accordance with intended purpose, the device is maintenance-free. Should there be a failure despite this, which you cannot eliminate yourself, or which requires opening the device, please contact CETONI GmbH to coordinate further actions. The device may only be opened by CETONI GmbH or thereby authorized service staff. Otherwise the warranty and guarantee claims are void.

Software-related troubles are dealt with in the Software Manual.

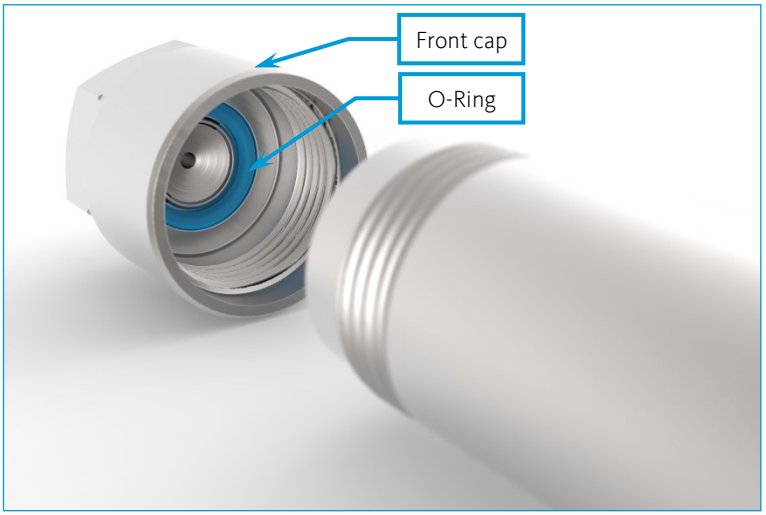
For cleaning it please rub the surface gently with a soft, damp cloth. The cloth must not be wet, so that no fluency can trickle into the device. In case of a heavier soiling you can also use a little bit of detergent or alcohol.

## 8.1 Syringes

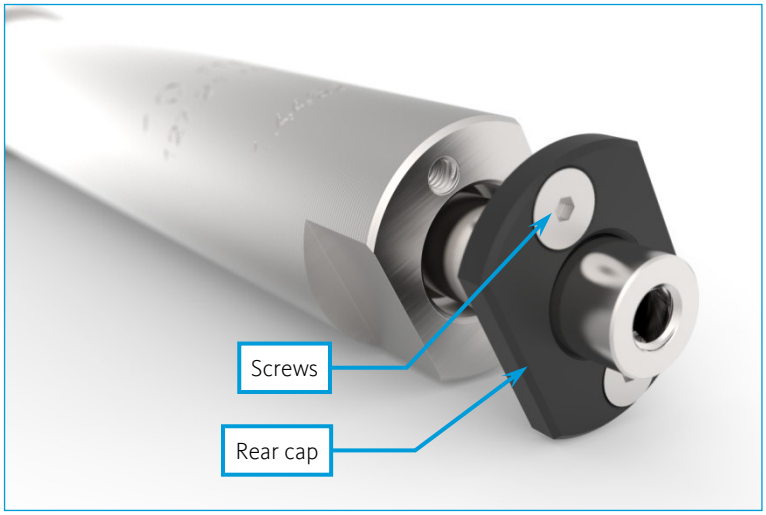
### 8.1.1 10 ml syringe NEM-B506-01 B

The front cap of the 10 ml syringe is screwed directly onto the cylinder and can be unscrewed for maintenance purposes. If the cap is too tight and cannot be moved by hand, use a 24 mm open-end wrench while holding backup on the rear of the cylinder with an 18 mm wrench.

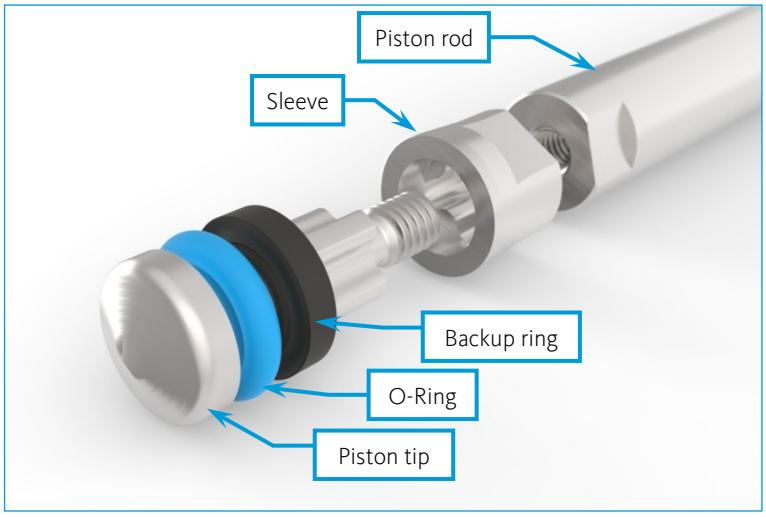
The front cap contains an O-ring of dimensions 12 x 2, which is shown in blue in the picture below. This does not wear normally, but can be changed for reasons of chemical resistance. Please observe the information on the hardness in Chapter 4.5 when you exchange the O-rings.



To remove the rear cap, simply unscrew the two screws with a 2 mm Allen key.




When the rear cap is removed, you can pull out the piston. To replace the O-ring (6x2), you need to disassemble the piston. Unscrew the piston tip by turning the sleeve with an 8 mm open-end wrench while holding backup on the piston with a second 8 mm wrench. Make sure that the concave side of the backup ring points towards the O-ring.

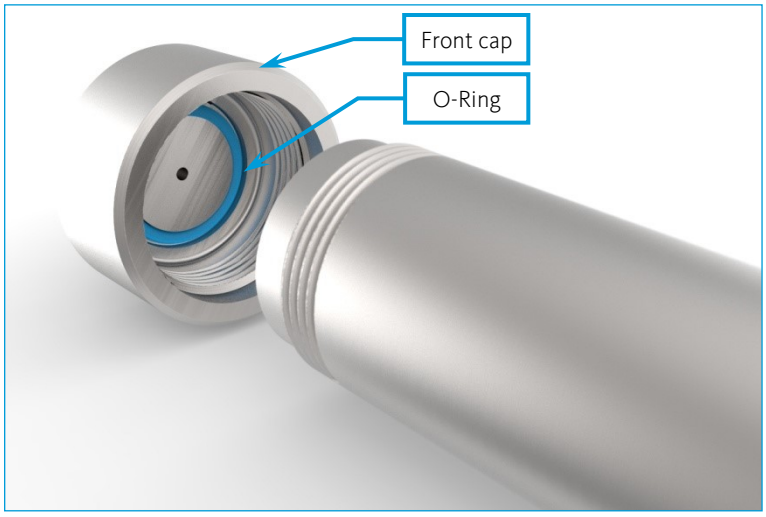



When reassembling simply proceed in the reverse order.

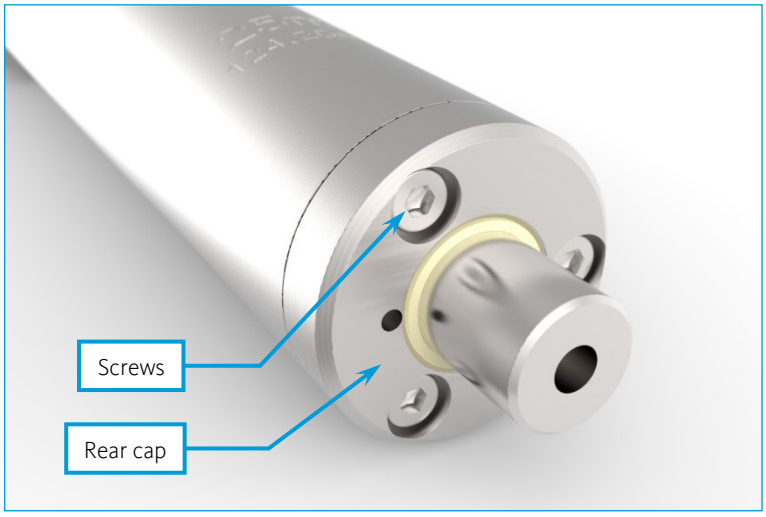
## 8.1.2 25 ml syringe NEM-B514-01 A

The front cap of the 25 ml syringe is screwed directly onto the cylinder and can be unscrewed for maintenance purposes. If the cap is too tight and cannot be moved by hand, use a 24 mm open-end wrench.

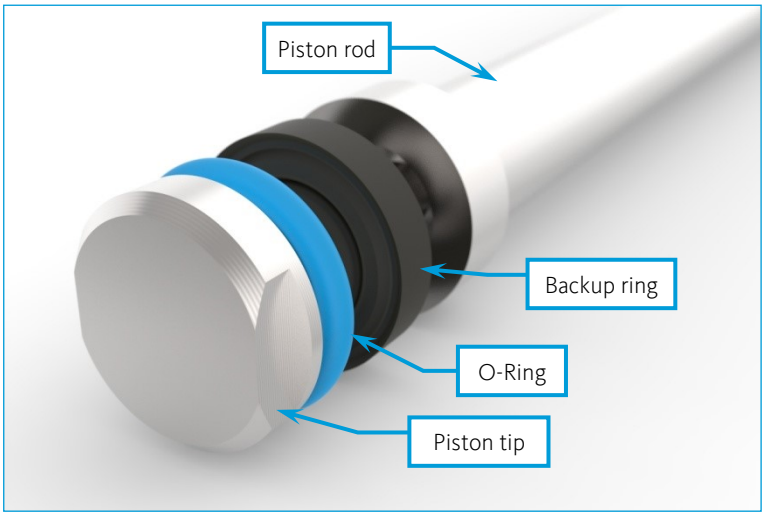
The front cap contains an O-ring of dimensions 18 x 2, which is shown in blue in the picture below. This does not wear normally, but can be changed for reasons of chemical resistance. Please observe the information on the hardness in Chapter 4.5 when you exchange the O-rings.




To remove the rear cap, simply unscrew the three screws with a 2.5 mm Allen key.



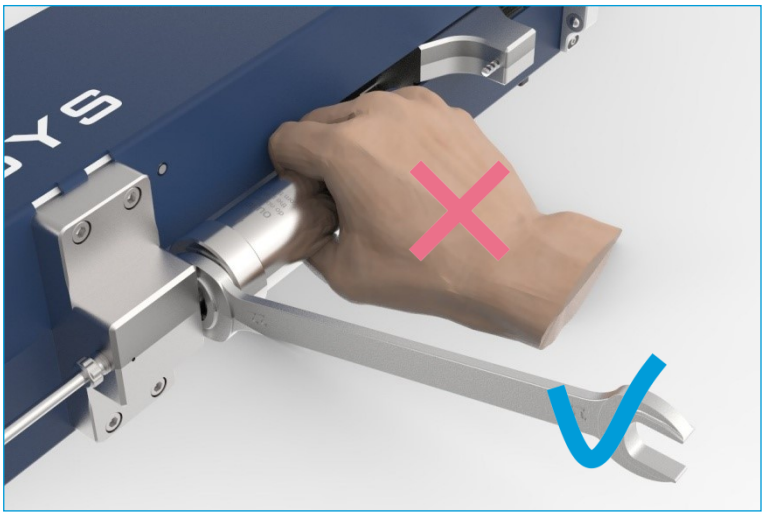
When the rear cap is removed, you can pull out the piston. To replace the O-ring (12x2), you need to disassemble the piston. Unscrew the piston tip with an 8 mm open-end wrench Make sure that the concave side of the backup ring points towards the O-ring.




When reassembling simply proceed in the reverse order.

## 8.1.3 75 ml syringe NEM-B551-01 A

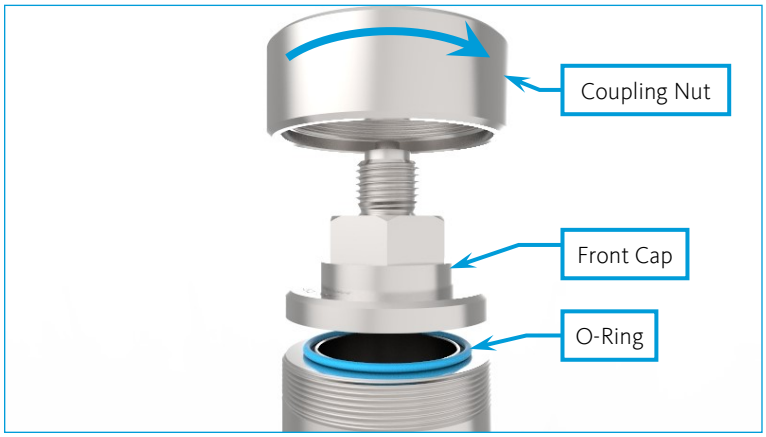
**CAUTION**. In order to torque down the syringe on the pump module, do not twist the cylinder. Instead, use a 22 mm open-end wrench and twist the front cap, which is provided with appropriate spanner flats.



### 8.1.3.1 (DIS-)ASSEMBLY OF THE FRONT CAP AND SEAL

The front cap of the 75 ml syringe is screwed onto the cylinder with a coupling nut. After unscrewing the coupling nut, you can simply remove the front cap and exchange the O-ring (31 x 1.5), if necessary. If the cap is too tight and cannot be moved by hand, use a 24 mm open-end wrench. This O-ring does not wear

normally, but can be changed for reasons of chemical resistance. Please observe the information on the hardness in Chapter 4.5 when you exchange the O-rings.




For assembly, hold the syringe upright, place the O-ring on the cylinder, and then screw on the front cap with the coupling nut.

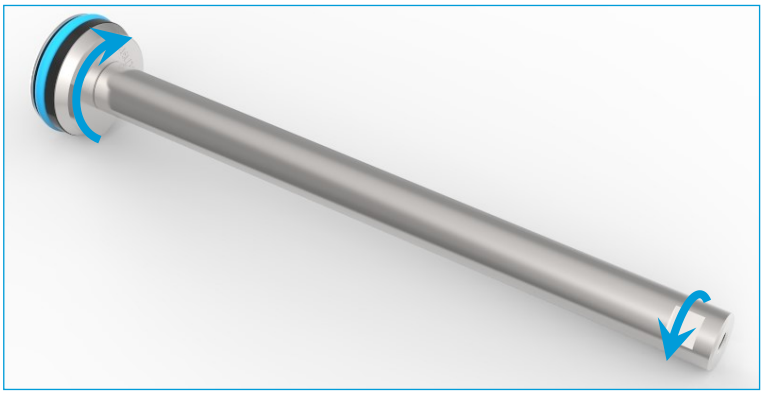
#### 8.1.3.2 (DIS-)ASSEMBLY OF THE PISTON

Pull the piston out until it touches the rear cap. Then unscrew the rear cap from the piston and gently pull the piston out of the cylinder as straight as possible.

For assembly gently slide the piston into the cylinder as straight as possible to avoid tilting. Then mount the cap with the sliding guide.

#### 8.1.3.4 (DIS-)ASSEMBLY OF THE PISTON SEAL

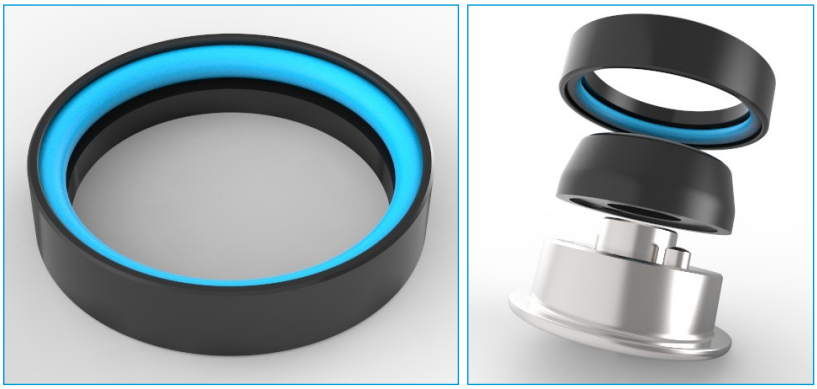
Use a 10 mm and a 19 mm open-end wrench to disassemble the piston.



You can now remove the seal and replace it with a new one. To avoid damaging the seal, do not use sharp or pointed objects to remove the seal. You can choose between a sliding ring and an O-ring seal with backup ring:

- Assembly of the sliding ring

  Insert the O-ring (23x2.5) into the sliding ring. Then use the mounting tool to slide the seal on-to the piston tip.



- Assembly of O-ring and backup ring

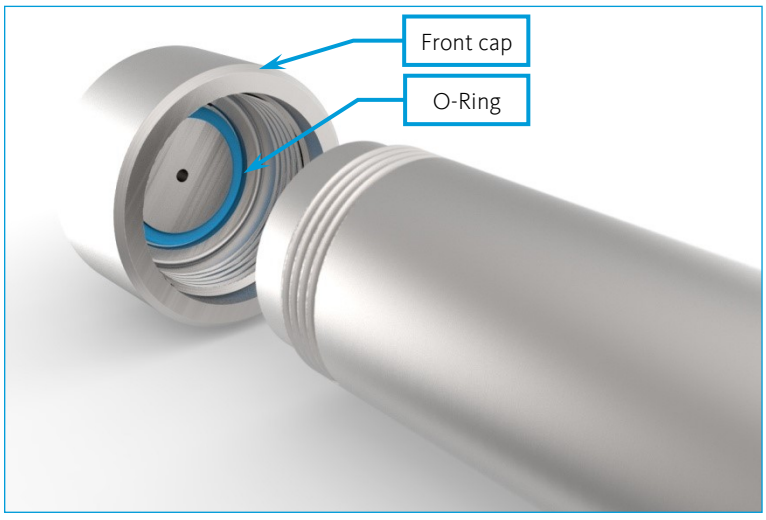
  Slide the O-ring (23x3) and the backup ring onto the piston tip. Make sure that the concave side of the backup ring points towards the O-ring.

Reassemble the piston. Insert the piston as straight as possible and without tilting into the syringe cylinder and fit the rear cap as soon as possible. Be particularly careful when mounting the piston, especially in the area of the threaded holes, so as not to damage the seal. The syringe is now ready for use again.

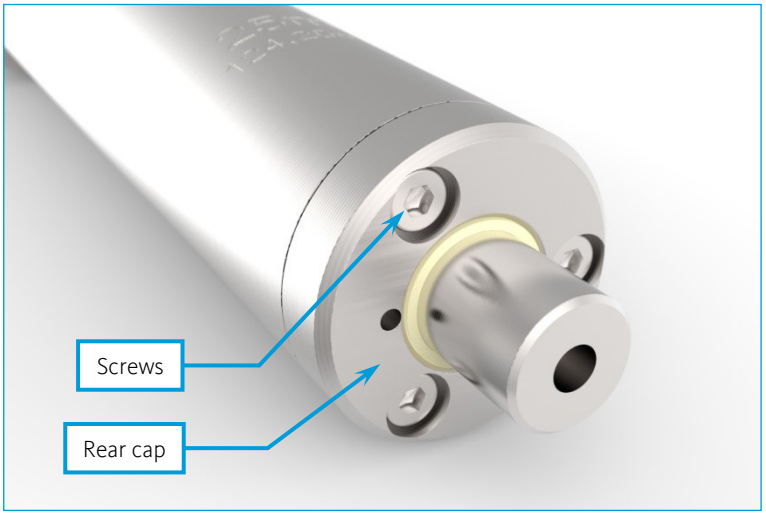
### 8.1.4 100 ml syringe NEM-B515-01 A

The front cap of the 100 ml syringe is screwed directly onto the cylinder and can be unscrewed for maintenance purposes. If the cap is too tight and cannot be moved by hand, use a 24 mm open-end wrench.

The front cap contains an O-ring of dimensions 34 x 2, which is shown in blue in the picture below. This does not wear normally, but can be changed for reasons of chemical resistance. Please observe the information on the hardness in Chapter 4.5 when you exchange the O-rings.



To remove the rear cap, simply unscrew the three screws with a 2.5 mm Allen key.



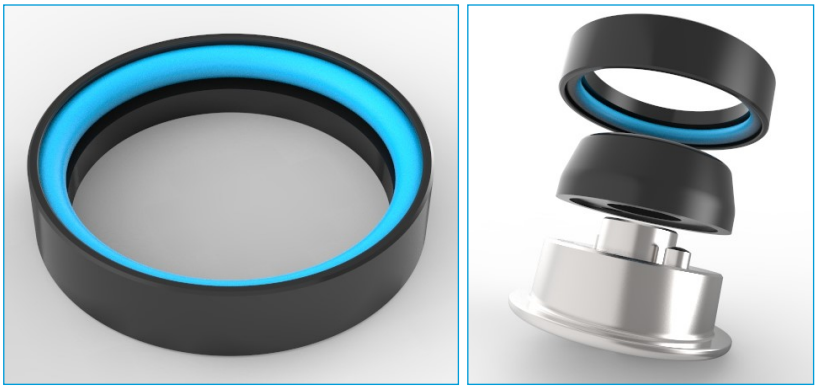

#### 8.1.4.1 (DIS-)ASSEMBLY OF THE PISTON SEAL

When the rear cap is removed, pull the piston carefully and as straight as possible out of the cylinder and disassemble the piston with a 10 mm and 24 mm open-end wrench.

You can now remove the seal and replace it with a new one. To avoid damaging the seal, do not use sharp or pointed objects to remove the seal. You can choose between a sliding ring and an O-ring seal with backup ring:

- Assembly of the sliding ring

  Insert the O-ring (27x2.5) into the sliding ring. Then use the mounting tool to slide the seal on-to the piston tip.



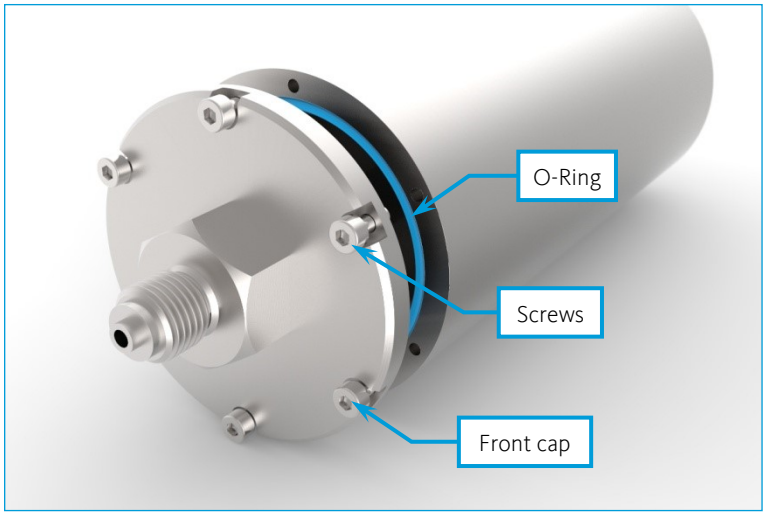
- Assembly of O-ring and backup ring

  Slide the O-ring (26x3) and the backup ring onto the piston tip. Make sure that the concave side of the backup ring points towards the O-ring.

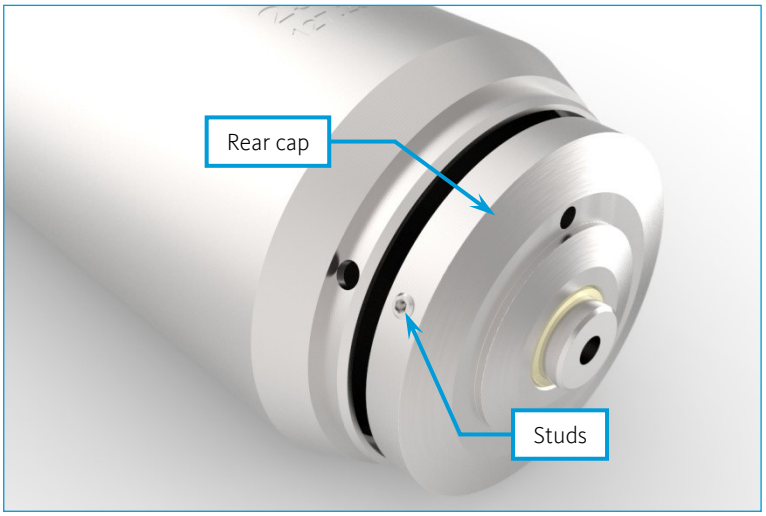
Reassemble the piston. Insert the piston as straight as possible and without tilting into the syringe cylinder and fit the rear cap as soon as possible. Be particularly careful when mounting the piston, especially in the area of the threaded holes, so as not to damage the seal. The syringe is now ready for use again.

### 8.1.5 250 ml syringe NEM-B516-01 A

To remove the front cap of the 250 ml syringe, the six screws need to be unscrewed using a 2.5 mm Allen wrench. Now you can access the O-ring (50x2).

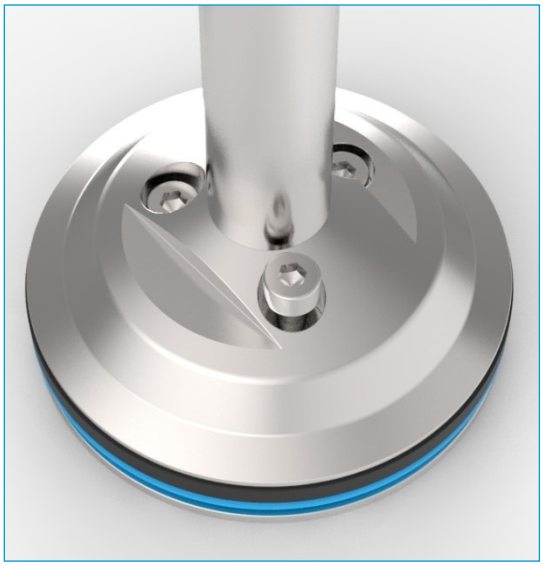


The rear cap is held in place by three studs. They need to be screwed in far enough to be able to remove the cover. Thereafter the piston can be pulled out.




#### 8.1.5.1 (DIS-)ASSEMBLY OF THE PISTON SEAL

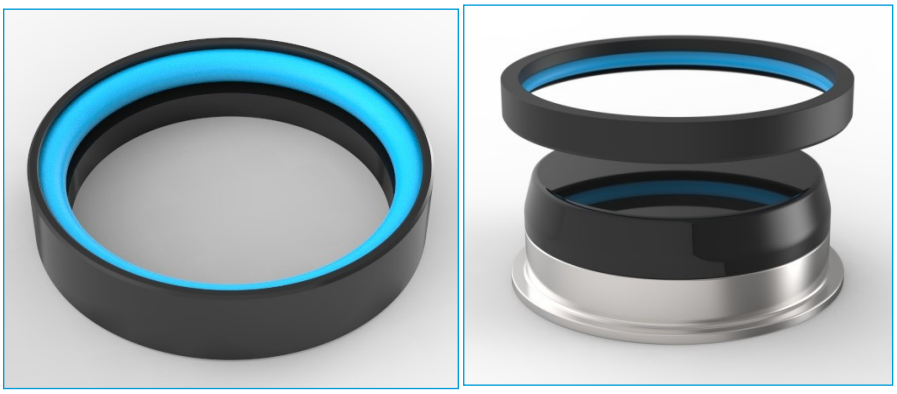
When the rear cap is removed, pull the piston carefully and as straight as possible out of the cylinder. To access the seal, remove the three screws with a 2.5 mm Allen key.



You can now remove the seal and replace it with a new one. To avoid damaging the seal, do not use sharp or pointed objects to remove the seal. You can choose between a sliding ring and an O-ring seal with backup ring:

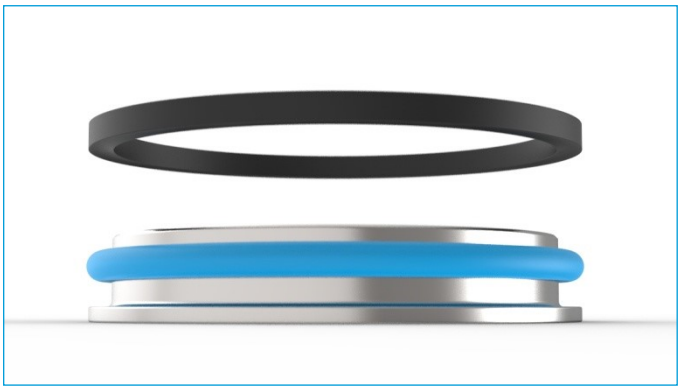
- Assembly of the sliding ring

  Insert the O-ring (44x2.5) into the sliding ring. Then use the mounting tool to slide the seal on-to the piston tip.



- Assembly of O-ring and backup ring

  Slide the O-ring (44x3) and the backup ring onto the piston tip. Make sure that the concave side of the backup ring points towards the O-ring.



Reassemble the piston. Insert the piston as straight as possible and without tilting into the syringe cylinder and fit the rear cap as soon as possible. The syringe is now ready for use again.

# 9 Disposal

This device is an electrical resp. electronic device.

The symbol of a crossed-out wheeled bin indicates that the respective device must be collected separately from unsorted municipal waste at the end of its service life.

If you wish to dispose of your device, please contact us as the manufacturer of the devices via the known contact channels. We will contact you immediately and provide you with all important information on how to return the equipment to our company site.

Please decontaminate the equipment before returning it, if necessary, and enclose the completed decontamination declaration.

Upon receipt of the returned equipment, we will take care of its proper disposal.